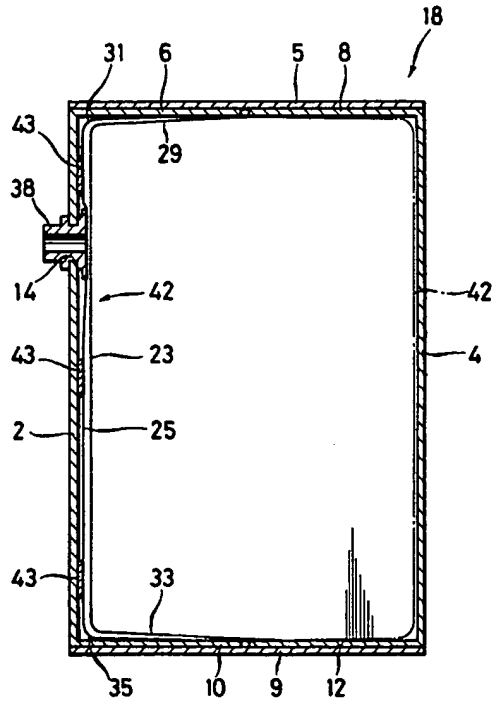
(12)UK Patent Application (19)GB (11) 2 117 736 A

(21) Application No 8307551
(22) Date of filing
18 Mar 1983
(30) Priority data
(31) 57/045720
57/188286
(32) 31 Mar 1982
13 Dec 1982
(33) Japan (JP)
(43) Application published
19 Oct 1983
(51) INT CL³ B65D 5/60
(52) Domestic classification
B8P K9
U1S 1450 B8P
(56) Documents cited
GB 0945217
GB 0944447
GB 0540564
(58) Field of search
B8P
(71) Applicant
Tokan Kogyo Company Limited
(Japan)
1-3-1 Uchisaiwai-cho
Chiyoda-ku
Tokyo
Japan
(72) Inventor
Hiroshi Aoyama
(74) Agent and/or Address for Service
D Young and Co
10 Staple Inn
London WC1V 7RD

(54) Bag-in-box type containers for liquid

(57) A container for liquid comprises an outer box (18) made of cardboard sheet having a rectangular parallelepiped shape, and an inner bag (42) made of polymer film or polymer sheet, the side walls of which bag, in a flattened empty state, are folded inwardly, and the top and bottom ends of which bag are sealed. The inner bag (42) is connected with the outer box (18) by means of a cylindrical mount (38). The inner bag (42) expands to a parallel piped shape which fits into the inside of the outer box (18) when the bag (42) is filled with liquid through the mouth (38).

FIG.9



GB 2 117 736 A

2117733

FIG.1

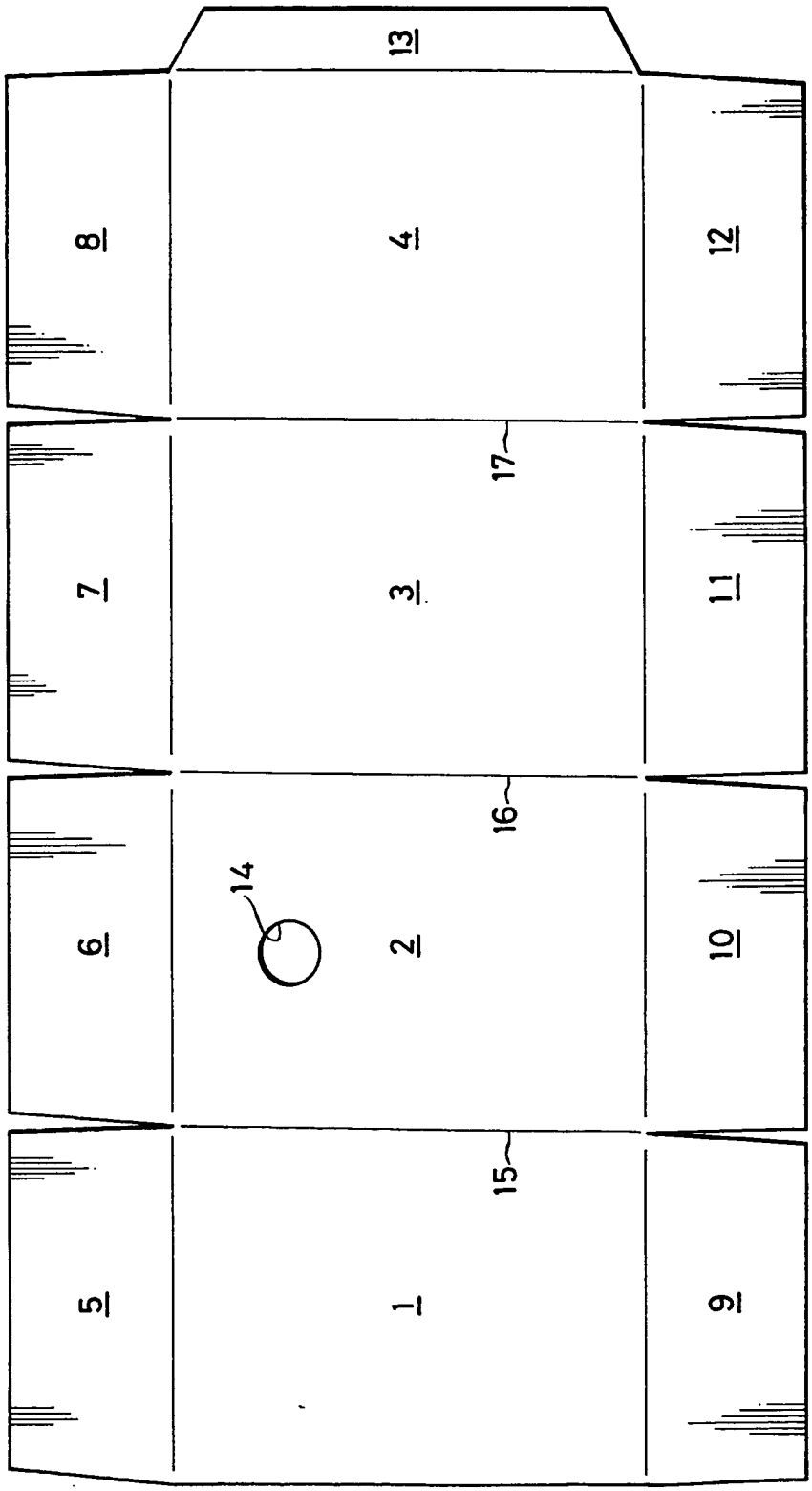
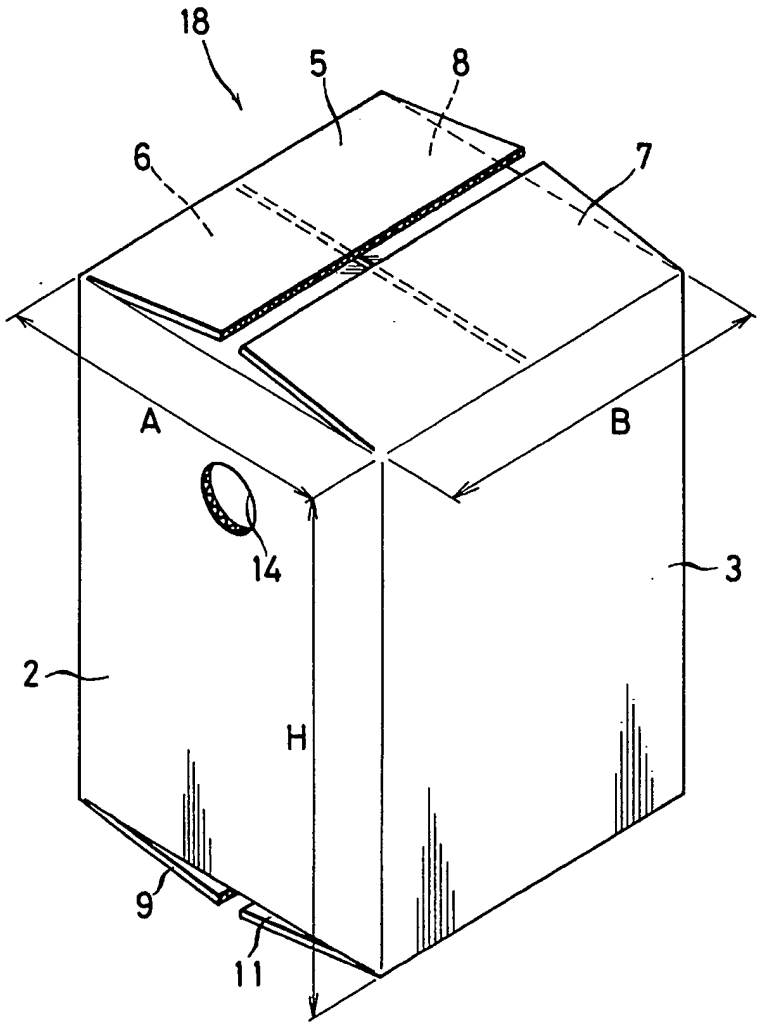


FIG.2



2117736

FIG.3

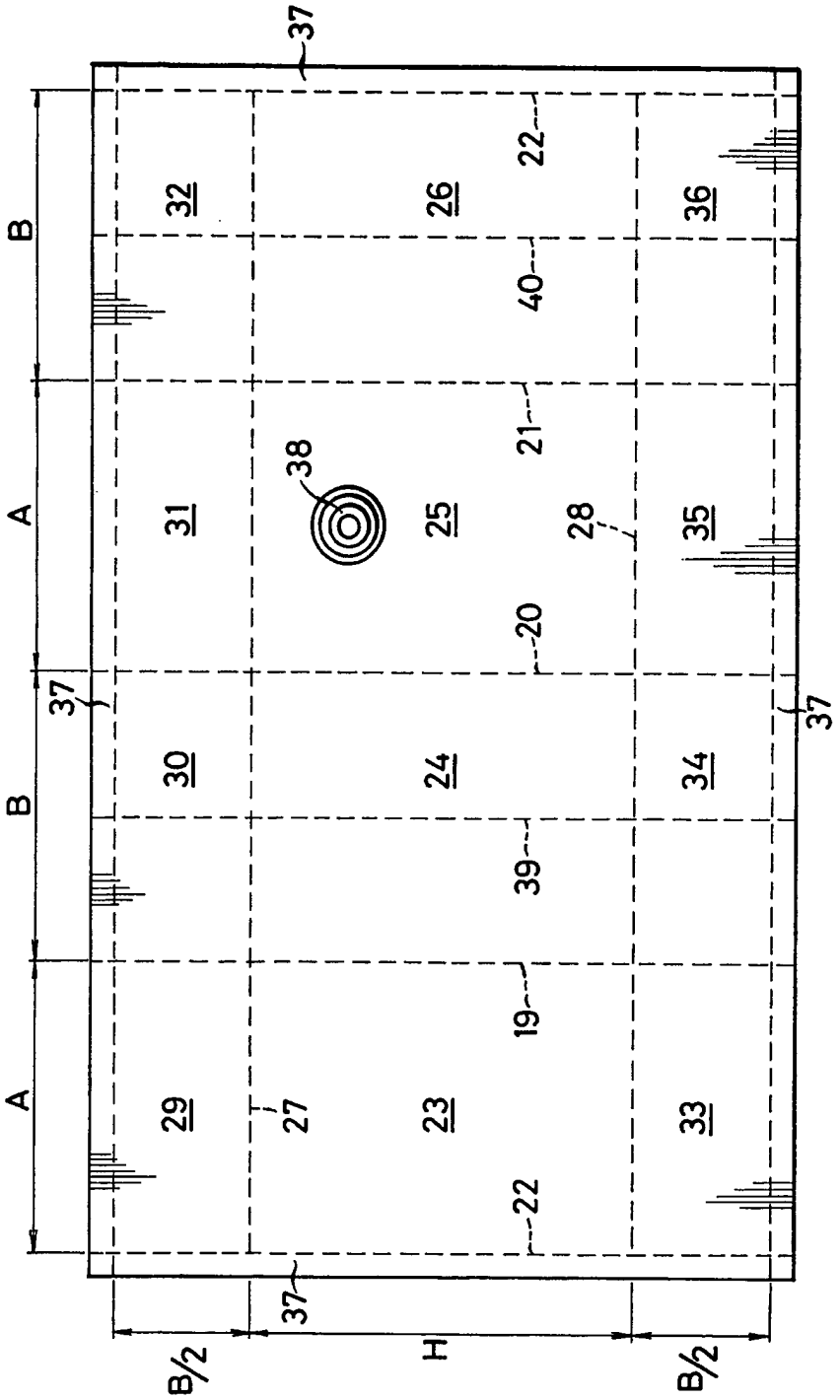


FIG.4

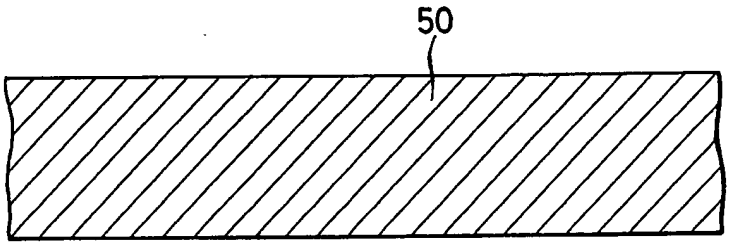


FIG.5

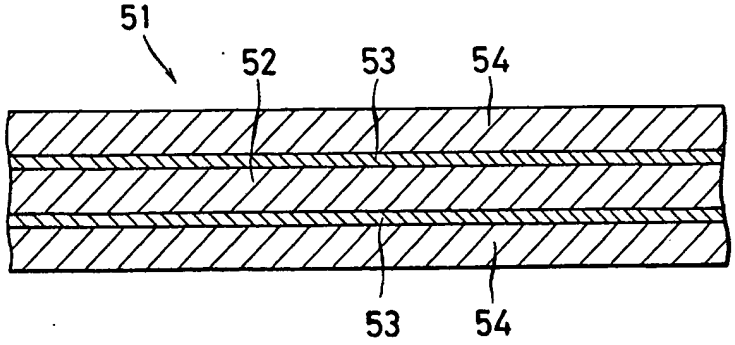
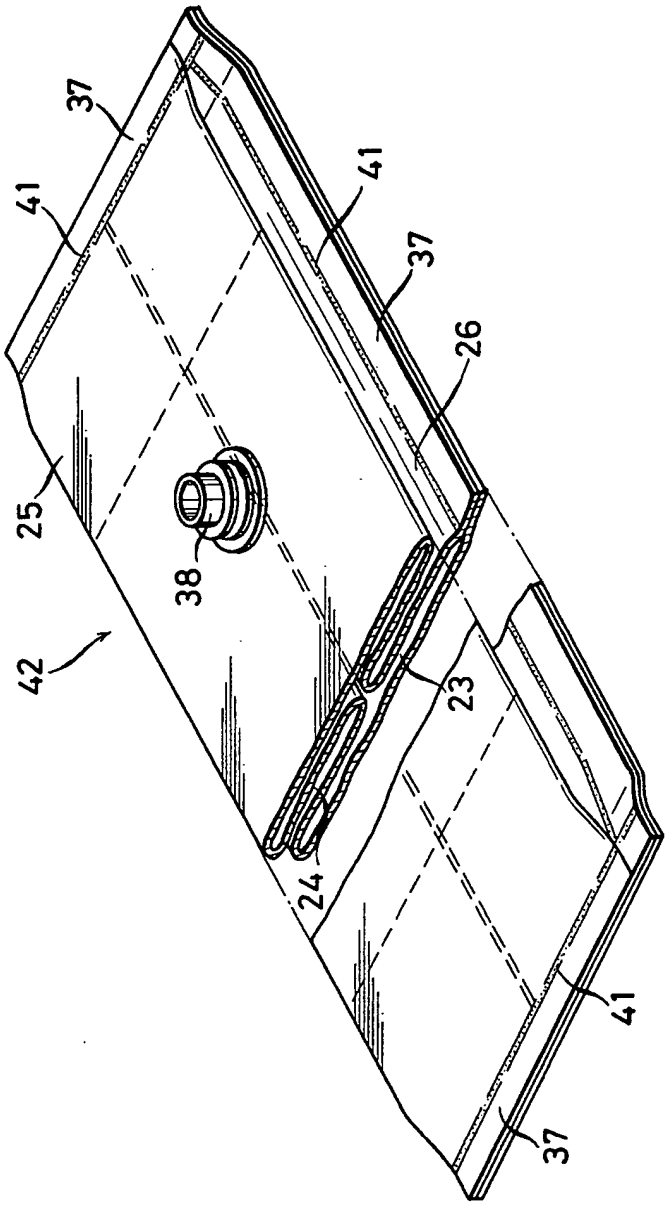
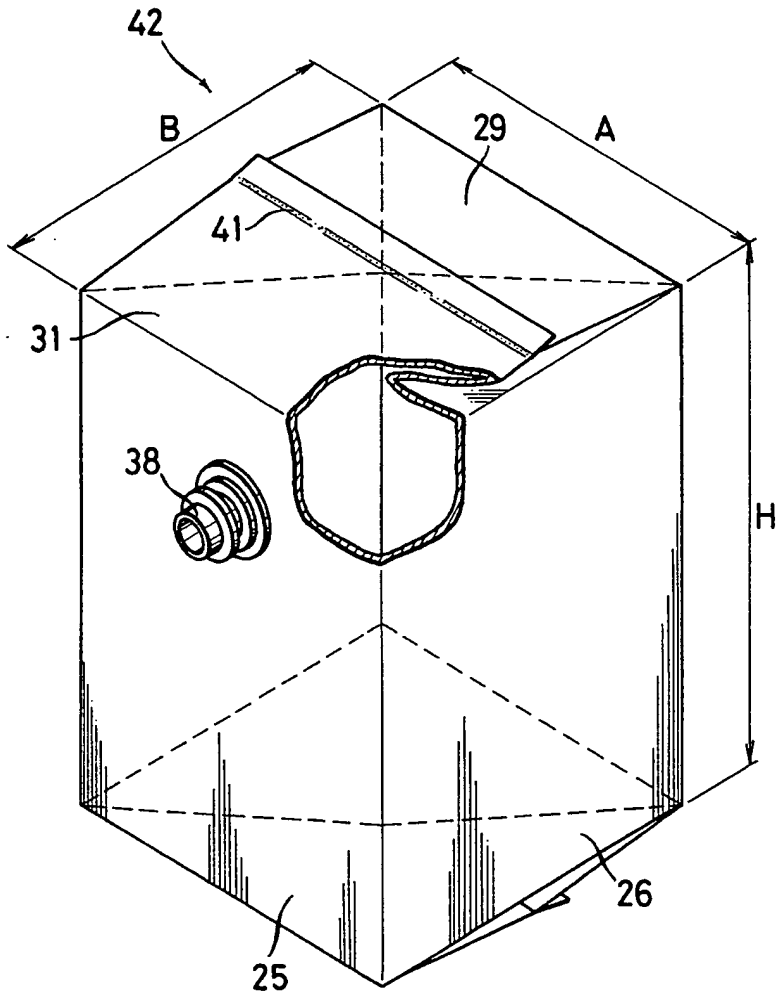


FIG.6



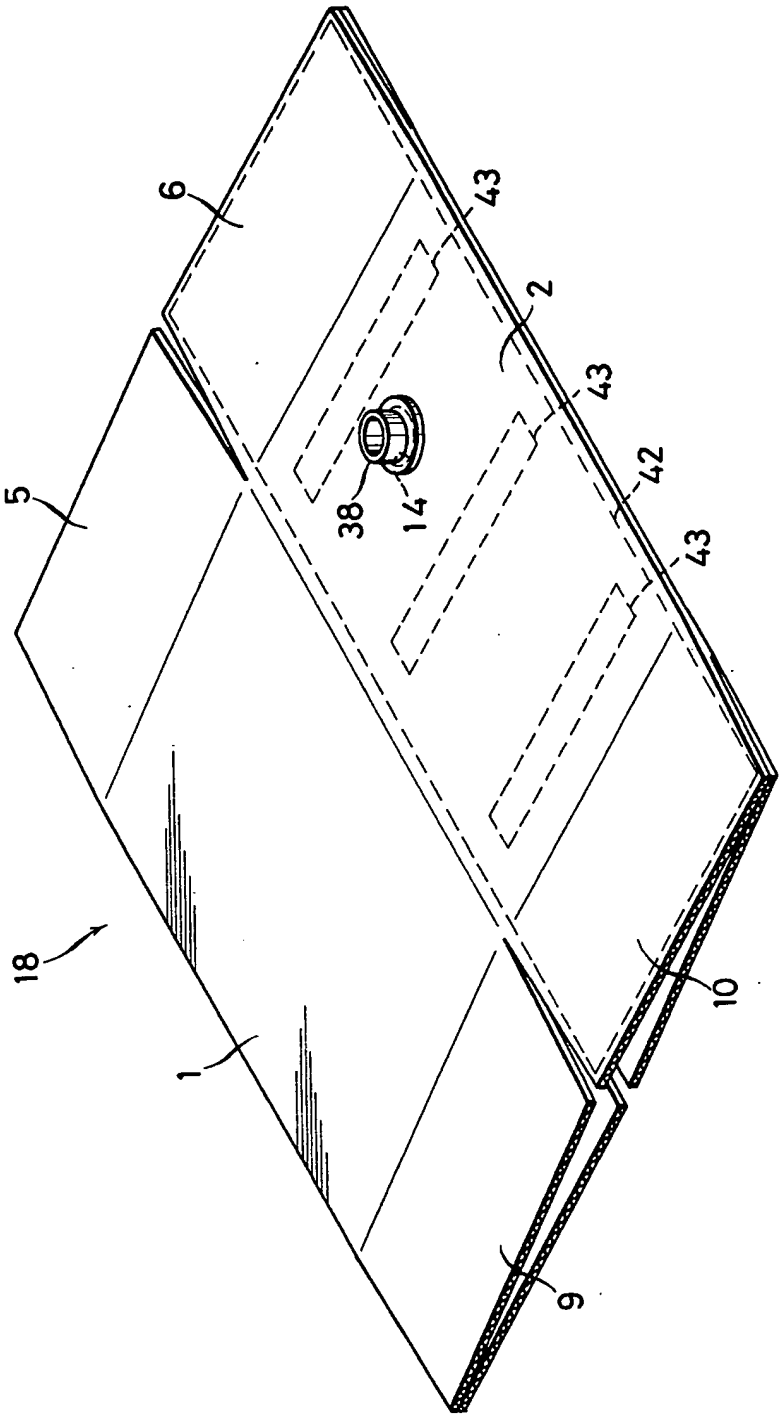
2117736

FIG.7



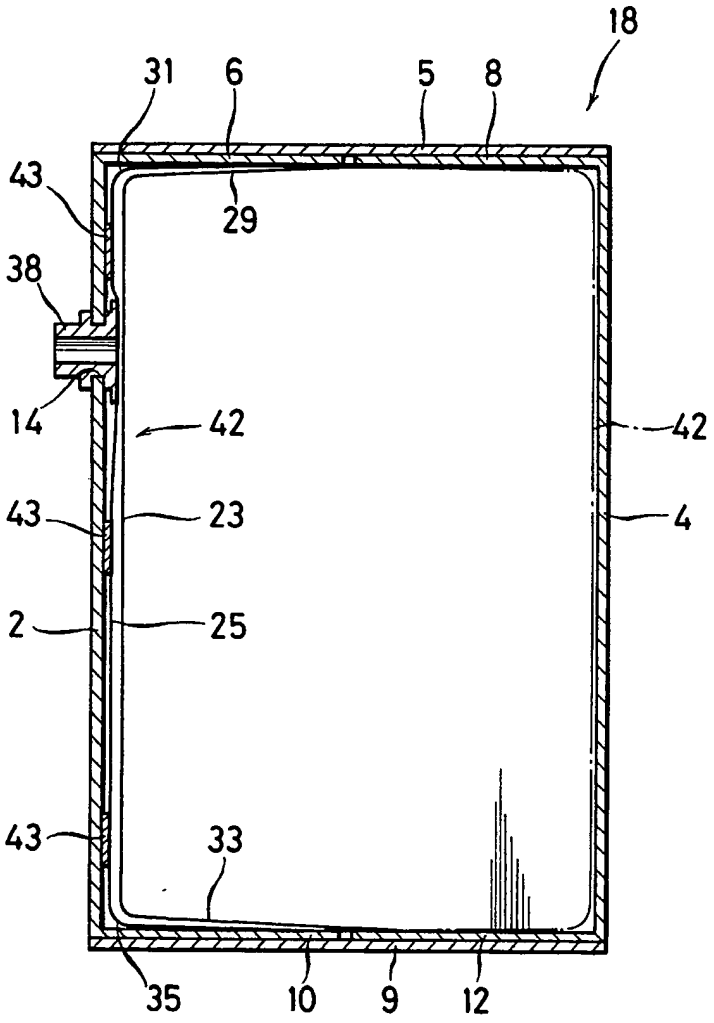
2117736

FIG.8



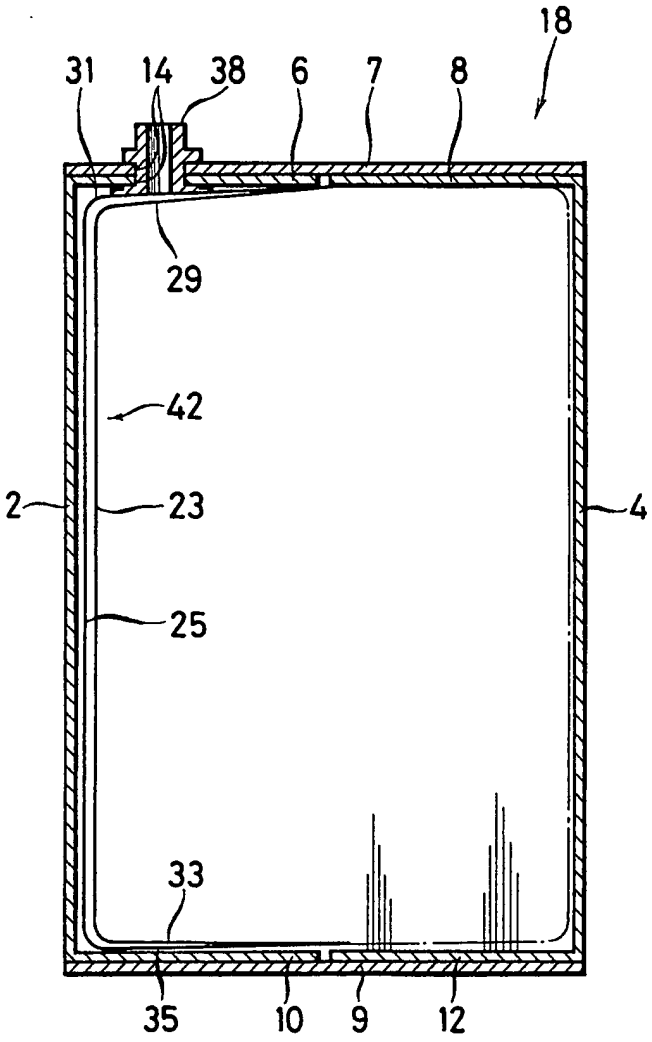
2117736

FIG.9



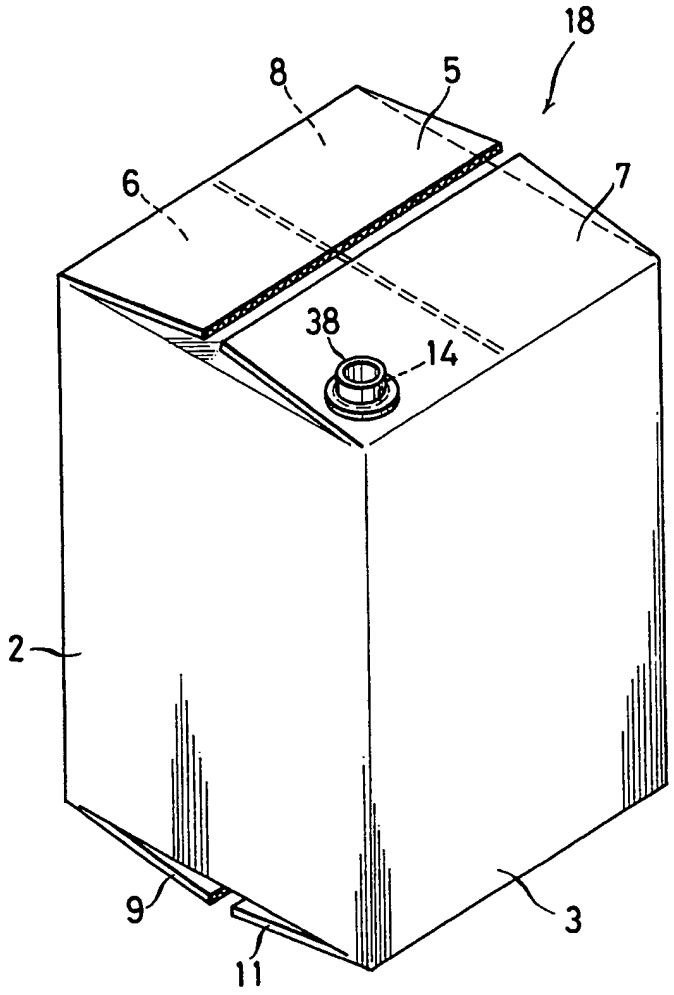
2117736

FIG.10



2117736

FIG.11



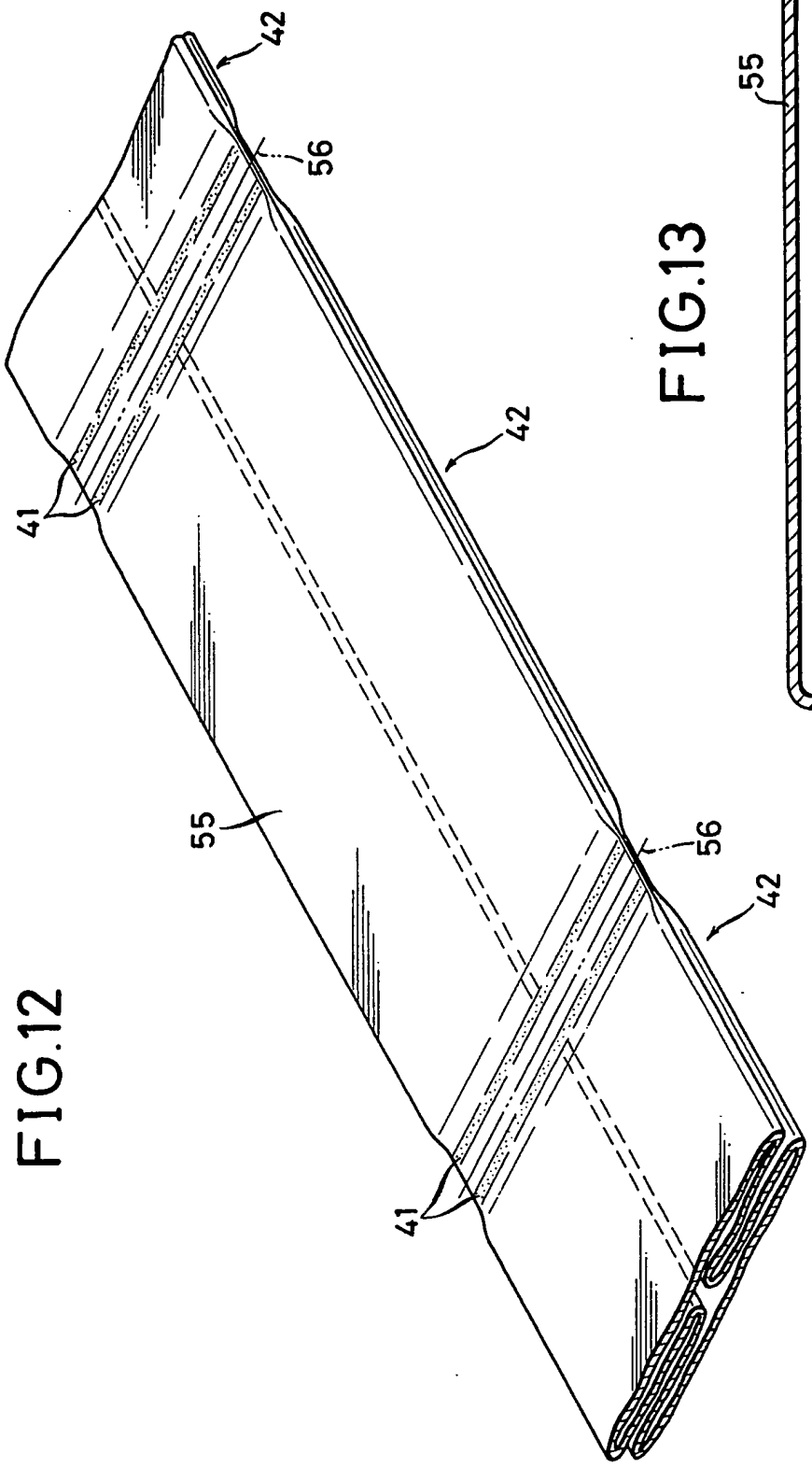


FIG.12

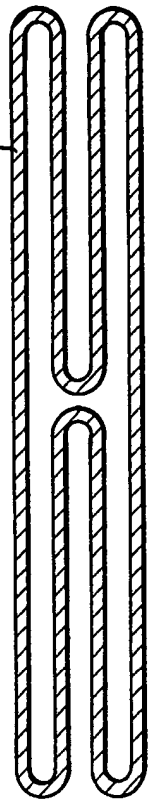


FIG.13

SPECIFICATION

Container for liquid

This invention relates to a container for liquid, and more specially, to a container comprised of an outer box made of cardboard and an expandable inner bag.

Conventional containers are made of metal, and metal containers or metal cans are used for holding various kinds of liquids. However this kind of container is expensive and tends to rust. Other conventional containers are made of glass, are very fragile, and are difficult to print thereon. Further conventional containers for liquid are made of plastics materials, but these containers are also rather expensive and lack mechanical strength. Still more, all of these conventional containers maintain a solid shape even though empty. Hence they are bulky and take up much space, despite being empty. To resolve the above problem, a compound box called a "bag in box" type container is used. This type of container includes an inner bag made of polymer resin enclosed in an outer cardboard box. The inner bag prevents the liquid therein from leaking, and the outer box provides structural strength and maintains the shape of the container.

However with this kind of compound container, the inner bag has a pillow shape when expanded, *i.e.* the inner bag is a mere bag. Hence gaps are formed between the outer box and the inner bag, because of the roundish shape of the pillow-like bag in a squarish outer box, and these gaps cause movement of the inner bag relative to the outer box when the container is moved during handling or transportation, and tearing and puncturing of the inner bag can take place. Specifically, the inner bag is often broken at the corners of the outer box where the gaps are formed. To remedy this defect, there is provided a multi-fold inner bag. By this arrangement, air is introduced between the films or the sheets forming the multi-fold bag, and hence the volume of the container is decreased. Further, due to the presence of this air, it becomes impossible to discharge all of the liquid from the container. Furthermore the bag made of the multi-fold sheet requires a large amount of film or sheet and is troublesome to manufacture.

According to the present invention, there is provided a container for liquid comprising:

an outer box made of cardboard having a rectangular parallel piped shape when set up and flat when folded; and

an inner bag made of a polymer film or sheet;

said film or sheet of said inner bag being folded inwardly at the sides and at least the top and bottom ends thereof being sealed to thereby expand into a rectangular parallel piped shape to fit into the inside of said outer box when filled with liquid, and being folded flat when empty.

Some embodiments of the present invention will now be described, by way of examples, with reference to the accompanying drawings, in which:–

Figure 1 is a developed plan view of the cardboard sheet for forming the outer box or carton of a container according to the present invention;

Figure 2 is a perspective view of the outer box set up from the sheet shown in Fig. 1;

Figure 3 is a developed plan view of a polymer film or sheet for forming the inner bag which is contained in the outer box;

Figure 4 is a cross-sectional view of the polymer film or sheet shown in Fig. 3;

Figure 5 is a cross-sectional view of a modified polymer film or sheet,

Figure 6 is a perspective view of the inner bag made of the polymer film or sheet when it is folded;

Figure 7 is a perspective view of the inner bag when expanded into a rectangular parallel piped shape;

Figure 8 is a perspective view of the outer box in its folded state with the inner bag contained therein;

Figure 9 is a vertical cross section of the outer box with the inner bag contained therein;

Figure 10 is a vertical cross section of a modified container with the inner bag contained therein;

Figure 11 is a perspective view of the container shown in Fig. 10;

Figure 12 is a perspective view of the modified inner bag; and

Figure 13 is a cross-sectional view of the inner bag shown in Fig. 12.

A container for liquid or compound box to be described with reference to the accompanying drawings comprises an outer box made of cardboard sheet. The outer box may have the same construction as a conventional cardboard carton. Specifically the box has four side wall panels 1, 2, 3, 4 as shown in Fig. 1, and flaps 5, 6, 7, 8 are connected to the top ends of the panels 1 to 4 respectively. The flaps 5 to 8 constitute a lid of the outer box when they are set up. Further four flaps 9, 10, 11, 12 are connected to the bottom ends of the panels 1 to 4, and the flaps 9 to 12 constitute the bottom wall of the box, when it is set up. In addition, a connecting flap 13 is provided on the right-hand end of the panel 4, as shown in Fig. 1, for connecting the panel 4 with the panel 1. A circular opening 14 is provided towards the top end of the panel 2.

The above mentioned cardboard sheet forms the outer box. That is, the sheet is folded along fold lies 15, 16, 17 respectively, and side wall panels 1 and 4 are connected with each other by means of the connecting flap 13. Further the top-side flaps 5 to 8 and the bottom-side flaps 9 to 12 are folded along fold lines, to thereby form the outer box 18 as shown in Fig. 2. The outer box 18 provides the mechanical strength of the container, and hence two-ply corrugated cardboard sheet is desirable.

Next, is described the inner bag which is contained inside the above mentioned outer box 18. The inner bag is made of polymer film or polymer sheet and formed to a rectangular shape as shown in Fig. 3. The film or the sheet may be made of Olefine group resin, for example polyethylene or polypropylene, and rubber or other buffer resin may be compounded to increase anti-shock strength. A single layer film 50 as shown in Fig. 4 is utilized when the inner bag does not require a bag wall impermeable to a gas or air. However, when a gas or air impermeability characteristic is required, a multi-layer film 51 is utilized as shown in Fig. 5. The film 51 comprises an intermediate polyvinylalcohol group resin layer 52, for example an Eval layer, and two polyethylene layers 54 are adhered to the top and bottom surfaces of the intermediate layer 52 by means of adhesive layers 53. This three layer construction (five layers when adhesive layer 53 is counted) gives film 51 a gas or air barrier, and oxygen is prevented from permeating through the film 51. For this reason, an inner bag made of the film 51 is suitable for storing for long periods liquids which are easily oxidized. The thickness of the film or sheet 50, 51 may vary in accordance with the volume of quality of the liquid contained therein. For example, when the volume of the bag is 10 litres, the thickness thereof may be from 100 to 170.

The film 50 or 51 is provided with four side panel portions 23, 24, 25, 26 which are indicated and separated by dotted lines 19, 20, 21 in Fig. 3. Top panel portions 29, 30, 31, 32 are located on the top side of the side panel portions 23 to 26 respectively and they are separated by dotted line 27, and also bottom panel portions 33, 34, 35, 36 are located on the bottom side of the side panel portions 23 to 26 respectively and are indicated by dotted line 28. Further spaces 37 for thermally sealing the film are formed on the top, bottom, left and right end portions thereof.

Further, the height of the side panel portions 23 to 26 of the film or the sheet are equal to the inner height *H* of the outer box 18 or corrugated cardboard carton shown in Fig. 2. Furthermore, the width of the side panel portions 23 and 25, and 24 and 26 are equal to inner width *A* and length *B* of the outer box 18 respectively. Still further, the height of the top panel portions 29 to 32 and the bottom panel portions 33 to 36 are equal to half the length *B* of the outer box 18. A cylindrical mouth 38 is provided on the side panel portion 25 for discharging liquid therefrom or pouring liquid thereinto.

On forming the inner bag with this film or sheet, the film is folded along dotted lines 19, 20, 21 as shown in Fig. 3 and Fig. 6. The side panel portions 24 and 26 are folded inside along dotted lines 39 and 40 which are positioned at the center of the side panel portions 24 and 26 respectively. Thus the film or the sheet is folded, and the side panel portions 24 and 26 are inserted into between the side panel portions 23 and 25. In this state, the spaces 37 formed on the end portions of the film or the sheet are thermally sealed and the inner bag is thus obtained as shown in Fig. 6. The sealed portions are denoted by reference number 41 in Fig. 6.

When liquid is poured into the bag 42 through the cylindrical mouth 38, the bag expands into the rectangular parallel piped shape as shown in Fig. 7. The height *H*, width *A*, and length *B* of the bag are respectively equal to inner height *H*, inner width *A*, and inner length *B* of the outer box as shown in Fig. 2.

The above mentioned bag 42 is located, in the folded state, under the side wall panel 2 of the outer box 18 as shown in Fig. 8. The cylindrical mouth 38 of the bag 42 is fitted into the circular opening 14 of the side wall panel 2 of the box 18, and the top of the mouth 38 projects through the opening 14 to the outside. The bag 42 may be connected to the box 18 merely engaging the mouth 38 and the opening 14, and may further be held between the side panel portion 25 of the bag 42 and the side wall panel 2 of the outer box 18 with double sided adhesive tape 43. By use of this adhesive tape 43, the bag 42 is more surely connected with the outer box 18.

The outer box 18 is folded in a flat state, and the inner bag 42 is connected in its folded state to the outer box 18 as shown in Fig. 8. Accordingly, the container is not bulky and requires little space for storage or transportation when the container is empty or when liquid therein has been discharged. During storage or transportation, the outer box 18 and the inner bag 42 may be separated from each other. In this case the inner bag 42 is easily connected to the outer box 18 just prior to pouring liquid into the container.

When liquid is to be introduced into the container, the outer box 18 is set up as shown in Fig. 9. The bag 42 in the outer box 18 is placed behind the side wall panel 2 in its folded state, and the top and bottom portions of the bag 42 are extended under flap 6 and over flap 10 of the outer box 18 respectively. That is, when liquid is not charged into the bag 42, the bag 42

maintains its folded state, even though the outer box is set up. In accordance with the charging of liquid into this container through the cylindrical mount 38, the inner bag 42 expands as shown by the chain-dotted line in Fig. 9. The bag 42 expands to the rectangular parallel piped shape as shown in Fig. 7, and the height *H*, width *A*, and length *B* of the bag 42 coincide with the corresponding inner dimensions of the outer bag 18, and the inner bag 42 is fitted into the inside of outer box 18.

Accordingly gaps are prevented from being formed between the inner bag 42 and the outer box 18 when liquid is introduced. Hence movement of the inner bag 42 relative to the outer box 18 is prevented when the container is transported. For this reason, the inner bag 42 is less likely to be broken or punctured, and hence liquid is safely entered and stored. As the inner bag 42 is fitted with the outer box 18 and is prevented from being broken or punctured, the inner bag 42 can be made of a single film or sheet, and hence the amount of film or sheet necessary for forming the inner bag 42 is reduced.

To prove the above mentioned effects, vibration tests were performed, and the results are shown in Table I in comparison to Table II which shows the results of a vibration test with a compound box according to the prior art. That is, the vibration test was performed in order to compare the container of this invention wherein the inner bag 42 expands into a rectangular parallel piped shape in the outer box 18 with a conventional container wherein an inner bag has a pillow shape and gaps are formed between the outer box and the inner bag. During this examination, the material of the outer box was the same, that is, there was used a BA-F type corrugated cardboard which has a first corrugation layer with a thickness of 5 mm and second corrugation layer with a thickness of 3 mm.

During this examination, the JIS-Z 0232 vibration test gives every sample level-1 vibration for 60 minutes wherein the magnitude of acceleration of the vibration is 1 *G*, the amplitude is 5 mm, and the frequency is 10 Hz. On the contrary, Tokan Company's test gives every sample vibration of 1 *G*, and in this test vertical vibration is effected on every container for 60 minutes, and then horizontal vibration for 60 minutes, and hence total time of this test is two hours. In the drop test, every container was dropped from a 90 cm height onto a concrete floor.

TABLE I (Result of This Invention)

		Sample 1	Sample 2	Sample 3
Material of inner bag		LLD–PE TAFMER 15%	LLD–PE 85% TAFMER 30%	LLD–PE 70%
Thickness of inner bag		130μ	150μ	150μ
Dimension of inner bag		A B H 220 × 205 × 230	A B H 220 × 205 × 230	A B H 220 × 205 × 230
Dimension of outer box		A B H 220 × 205 × 230	A B H 220 × 205 × 230	A B H 220 × 205 × 230
Material of outer box		BA–F	BA–F	BA–F
Vibration Test	JIS–Z 0232 vertical direction	0/3	0/3	0/3
	Tokan's Test vertical direction	0/3	0/3	0/3
	Tokan's Test horizontal direction	0/3	0/3	0/3
Drop Test	luquid temp. 20°C	0/5	0/5	0/5
	liquid temp. 5°C	0/5	0/5	0/5

TABLE II (Result of Prior Art)

			Sample 4	Sample 5	Sample 6	Sample 7
Material of inner bag			LLD-PE	LLD-PE 85% TAFMER 15%	EVA/HD-PE Twofold bag	PE/EVA/EVA Threefold bag
Thickness of inner bag			130μ	150μ	70μ/70μ	30μ/45μ/50μ
Dimension of inner bag			450 × 450	450 × 450	540 × 530	510 × 490
Dimension of outer box			A B H 30 × 235 × 226	A B H 230 × 235 × 226	A B H 230 × 235 × 226	A B H 230 × 235 × 226
Material of outer box			BA-F	BA-F	BA-F	BA-F
Vibration Test	JIS-Z 0232 vertical direction		2/3	2/3	3/3	1/3
	Tokan's Test	vertical direction	2/3	2/3	3/3	1/3
		horizontal direction	1/1	1/1	—	0/2
Drop Test	luquid temp. 20°C		0/5	0/5	0/5	0/3
	liquid temp. 5°C		0/5	0/5	0/5	0/3

The results of the above mentioned test are shown by *n*/*m*, meaning that *m* number of containers were examined and *n* number of containers' inner bags were broken by tears or punctures and liquid therein was leaked. According to the results of the test shown in Table I, the containers of this invention get very good marks. Namely the results of the containers of this invention are better than that of conventional containers with three fold inner bags which got the best results among the containers constructed according to the prior art. Therefore this result proves that gaps are not formed between the outer box 18 and inner bag 42, especially at the corners of the container of this invention, and therefore punctures or tears are surely prevented. Incidentally, it was seen from examination that prior-art pillow-type inner bags tore or received punctures and liquid was leaked especially where the bag meets corner of the outer box.

The container of this invention comprises the outer box 18 and the inner bag 42. The former is made of cardboard sheet and the latter is made of polymer film or sheet which is folded with edges sealed. Hence the container of this invention is highly productive, and inexpensive as compared to prior liquid containers made of metal or glass.

Next is described a modification of this invention with reference to Fig. 10 and Fig. 11. In these drawings, the same reference numbers are used for the corresponding portions of the above mentioned embodiment, and the descriptions of the same construction as that of the embodiment are omitted. The characteristic feature of this modification is that the cylindrical mount 38 of the inner bag 42 is not formed on the side panel portion 25 but provided on the top panel portion 31. In accordance with the alternation of the position of the mouth 38, openings 14 are formed on the flaps 6 and 7 of the outer box 18 to permit the cylindrical mouth 38 to project outwardly. Instead of opening 14, the cut-out portions may be formed through the flap 6, 7. According to this modification, the mouth 38 is located on the top surface of the carton 18, and is positioned at the corner thereof as shown in Fig. 11, and hence pouring of the liquid is facilitated.

Next a modified inner bag 42 is described with reference to Fig. 12 and Fig. 13. Although the above mentioned inner bag 42 is made of rectangular polymer film or sheet as shown in Fig. 3, the modified inner bag 42 is made of a cylindrical polymer tube 55. The sides of the cylindrical tube 55 are folded inwardly as shown in Fig. 13, and the tube 55 is thermally sealed along the sealing lines 41. That is, a pair of sealing lines 41 are formed at a predetermined interval of length in the axial direction of the tube 55, and the tube 55 is cut along the chain dotted lines 56 which extends between the pair of sealing lies 41 to form an inner bag 42. Accordingly, by this modification, the side sealing process is not required and hence the efficiency or producitivity of the inner bag is greatly enhanced.

Although an illustrative embodiment and modifications of this invention have been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to this precise embodiment or the described modifications, and that various changes and further modifications may be made therein by one skilled in the art without departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. A container for liquid comprising:
an outer box made of cardboard having a rectangular parallel piped shape when set up and flat when folded; and
an inner bag made of a polymer film or sheet;
said film or sheet of said inner bag being folded inwardly at the sides and at least the top and bottom ends thereof being sealed to thereby expand into a rectangular parallel piped shape to fit into the inside of said outer box when filled with liquid, and being folded flat when empty.

2. A container for liquid as claimed in claim 1, in which said outer box is made of corrugated cardboard sheet.

3. A container for liquid as claimed in claim 2, in which said corrugated cardboard has a plurality of corrugated layers.

4. A container for liquid as claimed in any preceding claim, in which said inner bag has a single fold.

5. A container for liquid as claimed in any preceding claim, in which said inner bag is provided with a cylindrical mouth for charging or discharging liquid, said cylindrical mouth engaging an opening in said outer box for connecting said inner bag with said outer box.

6. A container for liquid as claimed in claim 5, in which said opening to engage said cylindrical mouth is formed on the side wall panel of said outer box.

7. A container for liquid as claimed in claim 5, in which said opening to engage said cylindrical mouth is located on the top surface of said outer box.

8. A container for liquid as claimed in any preceding claim, in which said inner bag is made of a rectangular polymer film or sheet, a pair of opposite side panel portions of the bag are folded and inserted into between the other two side panel portions, and top, bottom and side ends are sealed to form an inner bag.

9. A container for liquid as claimed in any one of claims 1 to 7, in which said inner bag is made of a cylindrical polymer tube, two opposite side panel portions of the bag are folded and inserted into between the other two side panel portions, and the top and bottom ends thereof are sealed to form said inner bag.

10. A container for liquid as claimed in any preceding claim, in which said inner bag is made of a single layer film or sheet of Olefin group resin.

11. A container for liquid as claimed in claim 10, in which said Olefin group resin is compounded with rubber or buffer resin to increase anti-shock strength.

12. A container for liquid as claimed in claim 1, in which said inner bag is made of multi-layer film or sheet, and at least one of said layers is made of polyvinylalcohol group resin.

13. A container for liquid as claimed in claim 12, in which said polyvinylalcohol layer comprises at least one of the intermediate layers of said multi-layer film or sheet.

14. A container for liquid substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon) Ltd.—1983.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.